

Amendments to the Claims

1. (Currently amended) A method of preparing (S)-chiral alcohol comprising:

(a) reacting in organic solvent a compound of the following chemical formula 1 as a starting material,

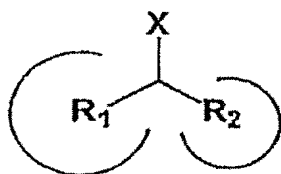
a racemization metal catalyst,

an acyl donor being capable of acylating an alcohol compound, and

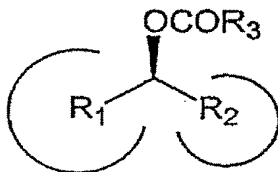
a protein hydrolysis enzyme selected from the group consisting of stabilized ~~or fixed~~ subtilisin, chymotrypsin, papain, protease from *Aspergillus oryzae*, protease from *Aspergillus melleus*, protease from *Streptomyces griseus*, and protease from *Bacillus stearothermophilus* and being capable of stimulating the enantioselective acylation of a racemic compound to obtain a chiral ester compound of chemical formula 3; and

(b) hydrolyzing the chiral ester compound of chemical formula 3 to obtain (S)-chiral alcohol;

[chemical formula 1]



[chemical formula 3]



wherein X is -OH or = O, R₁, R₂ and R₃ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅, alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈ arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-

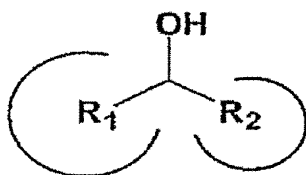
C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ ~~heterocycloalkyl~~ heterocycloalkyl, wherein the R₁ group and the R₂ group can be linked together, and wherein a size of a circular arc indicates that the R₁ group is larger than the R₂ group.

2. (Previously presented) The method of preparing (S)-chiral alcohol according to claim 1, further comprising adding a hydrogen donor in step (a) when the starting material of chemical formula 1 comprises a ketone such that X is =O.

3. (Currently amended) The method of preparing (S)-chiral alcohol according to claim 1:

wherein the starting material of chemical formula 1 is ~~[[the]]~~ a compound of the following chemical formula 1a;

[chemical formula 1a]

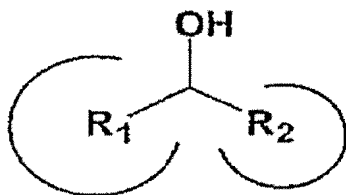


wherein R₁ and R₂ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈ arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ ~~heterocycloalkyl~~ heterocycloalkyl; and wherein R₁ and R₂ can be linked together.

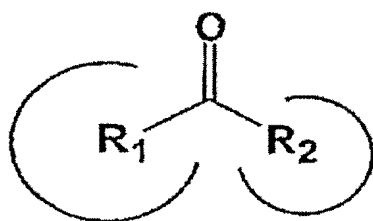
4. (Currently amended) The method of preparing (S)-chiral alcohol according to claim 3, further comprising:

obtaining an alcohol compound of chemical formula 1a by adding a hydrogen donor to a ketone compound of the following chemical formula 1b to reduce it;

[chemical formula 1a]



[chemical formula 1b]

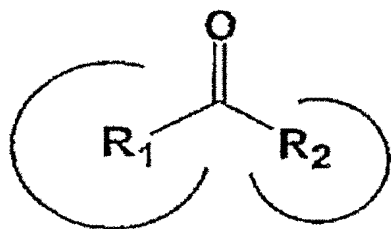


wherein R₁ and R₂ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈ arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ ~~heterocycloalkyl~~ heterocycloalkyl; and wherein R₁ and R₂ can be linked together.

5. (Currently amended) The method of preparing (S)-chiral alcohol according to claim 1, further comprising:

adding a hydrogen donor to reduce a ketone group in step (a); wherein the compound of chemical formula 1 comprises chemical formula 1b;

[chemical formula 1b]



wherein R₁ and R₂ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈ arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ ~~heterocycloalkyl~~ heterocycloalkyl; and

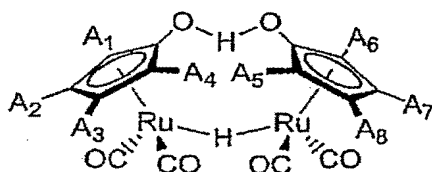
wherein R₁ and R₂ can be linked together.

6. (Previously presented) The method of preparing (S)-chiral alcohol according to claim 1, wherein step (a) of the reaction comprises a one-pot reaction and wherein the reaction is performed in one vessel.

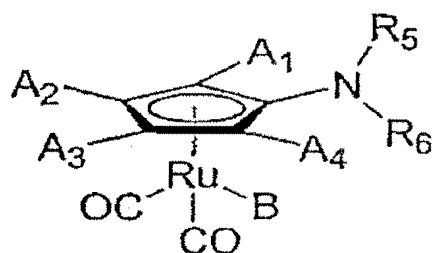
7. (Original) The method of preparing (S)-chiral alcohol according to claim 1, wherein the metal catalyst comprises a ruthenium complex compound.

8. (Original) The method of preparing (S)-chiral alcohol according to claim 1, wherein the metal catalyst is selected from the group consisting of ruthenium complex compounds represented by the following chemical formulas 4 to 8:

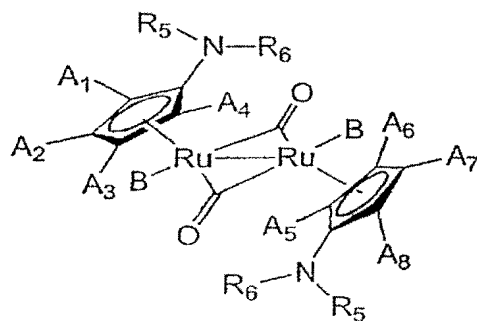
[chemical formula 4]



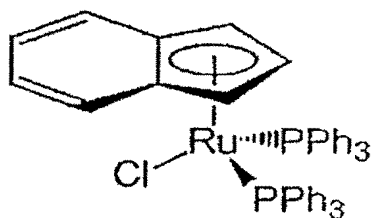
[chemical formula 5]



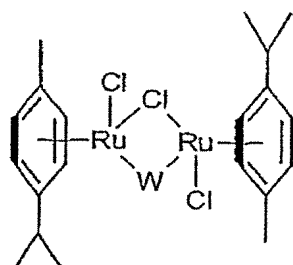
[chemical formula 6]



[chemical formula 7]



[chemical formula 8]



wherein A₁, A₂, A₃, A₄, A₅, A₆, A₇ and A₈ are independently hydrogen, substituted or unsubstituted C₁-C₁₀ alkyl, substituted or unsubstituted C₅-C₁₈ aryl, or substituted or unsubstituted C₂-C₂₀ heterocycle;

wherein R₅ and R₆ are independently hydrogen, substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted

C₆-C₁₈ arylalkyl, substituted or unsubstituted C₁-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ heterocycloalkyl; wherein B comprises a substituent selected from the group consisting of hydrogen, carbonyl, halogen and trifluoromethanesulfonate or there is no substituent in B site; and wherein W is hydrogen or a halogen.

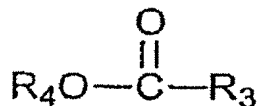
9. (Previously presented) The method of preparing (S)-chiral alcohol according to claim 2, wherein the acyl hydrogen donor comprises 2,4-dimethyl-3-pentanol, 2,6-dimethyl-4-heptanol, formic acid, or hydrogen.

10. (Original) The method of preparing (S)-chiral alcohol according to claim 1, wherein the acyl donor is linked to the R₁ group or the R₂ group of the chemical formula 1.

11. (Original) The method of preparing (S)-chiral alcohol according to claim 10, wherein the acyl donor is a substituent including a -OCO-R₃ terminal group linked to the R₁ or R₂ of the chemical formula 1.

12. (Previously presented) The method of preparing (S)-chiral alcohol according to claim 1, wherein the acyl donor is a compound of the chemical formula 2; and

[chemical formula 2]



wherein R₃ and R₄ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈

arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ heterocycloalkyl.

13. (Canceled)

14. (Original) The method of preparing (S)-chiral alcohol according to claim 1, wherein the protein hydrolysis enzyme is subtilisin.

15. (Original) The method of preparing (S)-chiral alcohol according to claim 1, wherein the organic solvent is benzene, toluene, C₅-C₁₀ alkane, C₅-C₁₀ cycloalkane, tetrahydrofuran, dioxane, C₂-C₁₀ dialkylether, C₃-C₁₀ alkylate, C₂-C₁₀ cyanoalkane, C₃-C₁₀ dialkyl ketone, dichloromethane, chloroform, carbon tetrachloride, C₄-C₁₀ tertiary alcohol, or a room temperature ionic liquid.

16. (Previously presented) The method of preparing (S)-chiral alcohol according to claim 1, wherein the reaction temperature in step (a) is at a temperature between room temperature and 80°C.

17. (Canceled)

18. (Currently amended) A method of preparing (S)-chiral ester comprising:

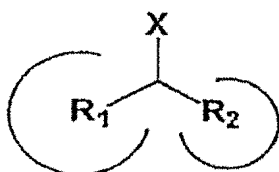
reacting in organic solvent a compound of the following chemical formula 1 as a starting material,

a racemization metal catalyst,

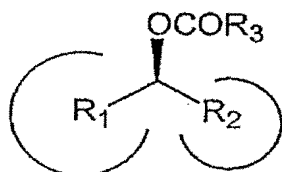
an acyl donor being capable of acylating an alcohol compound, and

a protein hydrolysis enzyme selected from the group consisting of stabilized or fixed subtilisin, chymotrypsin, papain, protease from *Aspergillus oryzae*, protease from *Aspergillus melleus*, protease from *Streptomyces griseus*, and protease from *Bacillus stearothermophilus* and being capable of stimulating the enantioselective acylation of a racemic compound to obtain a chiral ester compound of chemical formula 3.

[chemical formula 1]



[chemical formula 3]



wherein R_1 and R_2 are independently substituted or unsubstituted C_1 - C_{15} alkyl, substituted or unsubstituted C_2 - C_{15} alkenyl, substituted or unsubstituted C_2 - C_{15} alkynyl, substituted or unsubstituted C_5 - C_{18} aryl, substituted or unsubstituted C_6 - C_{18} arylalkyl, substituted or unsubstituted C_2 - C_{20} heterocycle, substituted or unsubstituted C_3 - C_{20} heteroarylalkyl, substituted or unsubstituted C_3 - C_{15} cycloalkyl, substituted or unsubstituted C_3 - C_{15} cycloalkenyl, substituted or unsubstituted C_6 - C_{15} cycloalkynyl, or substituted or unsubstituted C_3 - C_{20} ~~heterocycloalkyl~~ heterocycloalkyl, and R_1 and R_2 can be linked together; and wherein a size of a circular arc indicates that the R_1 group is larger than the R_2 group.

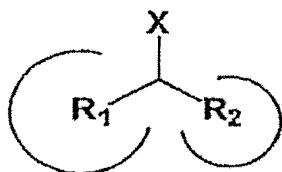
19. (Previously presented) The method of preparing (S)-chiral ester according to claim 18, further comprising adding a hydrogen donor in step (a) and wherein the starting material comprises ketone where $X=O$.

20. (Canceled)

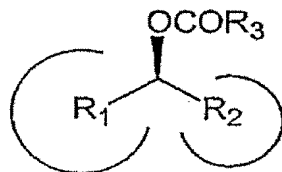
21. (Previously presented) A method of preparing (S)-chiral alcohol of the following chemical formula 1 comprising:

hydrolyzing the chiral ester of the chemical formula 3 prepared according to claim 18.

[chemical formula 1]



[chemical formula 3]



wherein X is -OH or = O,

wherein R₁, R₂ and R₃ are independently substituted or unsubstituted C₁-C₁₅ alkyl, substituted or unsubstituted C₂-C₁₅ alkenyl, substituted or unsubstituted C₂-C₁₅ alkynyl, substituted or unsubstituted C₅-C₁₈ aryl, substituted or unsubstituted C₆-C₁₈ arylalkyl, substituted or unsubstituted C₂-C₂₀ heterocycle, substituted or unsubstituted C₃-C₂₀ heteroarylalkyl, substituted or unsubstituted C₃-C₁₆ cycloalkyl, substituted or unsubstituted C₃-C₁₅ cycloalkenyl, substituted or unsubstituted C₆-C₁₅ cycloalkynyl, or substituted or unsubstituted C₃-C₂₀ heterocycloalkyl; wherein R₁ and R₂ can be linked together; and wherein a size of a circular arc indicates that the R₁ group is larger than the R₂ group.